A study on thermodynamic potential energy for magnetostrictive system

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Abstract

The coupled modelling of mechanical, electrical, thermal and magnetic fields are studied in a thermo-magneto-electric medium through a thermodynamic potential. Hamilton's principle is used to obtain the dynamic equations of motion that can be used for examining the behaviour of piezoelectric and magnetostrictive sensors and actuators. The thermodynamic potential energy is a key element in the equations and hence its various constituents are derived via the finite element method. Case studies include magnetoelectric and magnetostrictive systems subjected to various types of inputs. The response and thermodynamic potential energy of these systems are computed and plotted.